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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/559,903	04/26/2000	Zhiping Yin	303.925US1	1798
21186 7590 03/15/2007 SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			EXAMINER LANDAU, MATTHEW C	
			ART UNIT	PAPER NUMBER
			2815	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		03/15/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/559,903	YIN ET AL.	
	Examiner	Art Unit	
	Matthew Landau	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 27,33,36-38 and 44-52 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 27,33,36-38 and 44-52 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

Claim 27 is objected to because of the following informalities: the limitation “a silicon nitride layer on the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ wherein the polysilicon layer...” is objected to.

It is suggested a comma be inserted between “ $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ ” and “wherein”.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 27, 33, 36-38, and 44-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al. (US Pat. 6,541,164, hereinafter Kumar) in view of Applicant's admitted prior art (hereinafter APA), or in the alternative, as being unpatentable over Kumar in view of the APA and Chen et al. (US Pat. 4,905,073, hereinafter Chen).

Regarding claims 27 and 44, Figures 2, 11, 14, and 17 of Kumar disclose a gate stack, comprising: a gate oxide layer 14 over a semiconductor substrate 12; a polysilicon layer 16a on the gate oxide layer; a metal silicide layer 22 on the polysilicon layer; an antireflection layer 18 comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ (col. 9, lines 1-7) formed over and in physical contact with the metal silicide layer; and a silicon nitride layer 23 (col. 9, lines 35-37) on the layer comprising Si_xN_y .

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$O_z:H$, wherein the polysilicon layer, the gate oxide layer, the metal silicide layer, the layer comprising $Si_xN_yO_z:H$, and the silicon nitride layer are patterned to form the gate stack. Kumar does not disclose the specific claimed values for variable x , y , and z , and therefore does not disclose the specific composition claimed. Figure 3 of the instant application discloses an antireflective layer 26 made of $Si_xN_yO_z:H$, wherein x is from 0.39 to 0.65, y is from 0.02 to 0.56, and z is from 0.05 to 0.33 (see page 3, lines 13-15 of the instant specification). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by using an antireflective layer having a composition as taught by the APA for the purpose of selecting known values (for the amounts of each element) to obtain an effective antireflective layer. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Kumar by using the claimed values, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It is known that the composition of an antireflection layer affects the optical properties, therefore the claimed variables are result effective variables. The limitations “annealed metal silicide layer” and “the annealed metal silicide layer being the product of a process in which the metal silicide layer is subjected to an anneal treatment after the layer comprising $Si_xN_yO_z:H$ is formed” are merely product-by-process limitations that do not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. The burden is

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on Applicant to show that the process necessarily results in structurally different product from that disclosed in the prior art.

Assuming, *arguendo*, that Applicant can prove that annealing a metal silicide layer inherently results in structurally different product, the claim would still be held obvious in view of Chen. Chen discloses annealing a metal silicide layer in a nitrogen atmosphere (col. 3, lines 49-51). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by annealing the metal silicide layer for the purpose of improving the resistivity (see col. 3, lines 49-51 of Chen). Note that the limitations “the layer $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ protects the annealed metal silicide layer during the anneal by eliminating exposure to gaseous oxygen during the anneal” (claim 27) and the limitation “means for protecting the metal silicide layer during an anneal” (claim 44) are merely recitations of intended use that do not structurally distinguish the claimed invention over the prior art. After the above combination, the $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ layer is inherently capable of performing the recited function, therefore the limitation is met.

Regarding claims 33 and 47, Kumar discloses the layer 18 comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ has a thickness of 300 angstroms (col. 30, lines 58-61).

Regarding claims 36, 37, 45, and 51, Kumar and the APA do not disclose the specific claimed values for variable x, y, and z (specifically, $x=0.5$, $y=0.37$, and $z=0.13$). However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Kumar by using the claimed values, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It is known that the composition of

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an antireflection layer affects the optical properties, therefore the claimed variables are result effective variables.

Regarding claims 38 and 46, Kumar discloses the metal silicide is tungsten silicide (col. 8, lines 17 and 18). However, Chen discloses tungsten silicide and titanium silicide can be equivalently used for the same purpose. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by using titanium silicide for the purpose of substituting an equivalent material that is known to be used for the same purpose (see MPEP 2144.06).

Regarding claim 48, the limitation “the means for protecting the metal silicide layer during is adapted to protect the metal silicide layer from gaseous oxygen during the anneal” is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. After the above combination, the $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ layer is inherently capable of performing the recited function, therefore the limitation is met.

Regarding claim 49, the limitation “the means for protecting the metal silicide layer during is adapted to alleviate stress exerted by the silicon nitride layer on layers underlying the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ ” is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ layer 18 of Kumar is capable of performing the recited function, therefore the limitation is met.

Regarding claims 50, Figures 2, 11, 14, and 17 of Kumar disclose a gate stack, comprising: a gate oxide layer 14 over a semiconductor substrate 12; a polysilicon layer 16a on

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the gate oxide layer; a metal silicide layer 22 on the polysilicon layer; an antireflection layer 18 comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ (col. 9, lines 1-7) formed over and in physical contact with the metal silicide layer; and a silicon nitride layer 23 (col. 9, lines 35-37) on the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$, wherein the polysilicon layer, the gate oxide layer, the metal silicide layer, the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$, and the silicon nitride layer are patterned to form the gate stack. Kumar does not disclose the specific claimed values for variable x, y, and z and therefore does not disclose the specific composition claimed. Figure 3 of the instant application discloses an antireflective layer 26 made of $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$, wherein x is from 0.39 to 0.65, y is from 0.02 to 0.56, and z is from 0.05 to 0.33 (see page 3, lines 13-15 of the instant specification). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by using an antireflective layer having a composition as taught by the APA for the purpose of selecting known values (for the amounts of each element) to obtain an effective antireflective layer. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Kumar by using the claimed values, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It is known that the composition of an antireflection layer affects the optical properties, therefore the claimed variables are result effective variables. Kumar discloses the metal silicide is tungsten silicide (col. 8, lines 17 and 18). However, Chen discloses tungsten silicide and titanium silicide can be equivalently used for the same purpose. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by using titanium silicide for the purpose of substituting an

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equivalent material that is known to be used for the same purpose (see MPEP 2144.06). The limitation “annealed” is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. The burden is on Applicant to show that the process necessarily results in structurally different product from that disclosed in the prior art.

Assuming, *arguendo*, that Applicant can prove that annealing a metal silicide layer inherently results in structurally different product, the claim would still be held obvious in view of Chen. Chen discloses annealing a metal silicide layer in a nitrogen atmosphere (col. 3, lines 49-51). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by annealing the metal silicide layer for the purpose of improving the resistivity (see col. 3, lines 49-51 of Chen). The limitation “for alleviating stress on underlying layers, canceling reflected radiation, and protecting the annealed, titanium silicide layer during an anneal from gaseous oxygen” is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. After the above combination, the $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ layer is inherently capable of performing the recited function, therefore the limitation is met.

Regarding claim 52, Kumar discloses the layer 18 comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ has a thickness of 300 angstroms (col. 30, lines 58-61).

Response to Arguments

Applicant's arguments filed January 8, 2007 have been fully considered but they are not persuasive.

Applicant argues that “the Kumar reference teaches a preferred “...composition of matter having the formula: $\text{SiO}_x\text{N}_y\text{H}_z...$ ”. In contrast, in the various disclosed embodiments of the present invention, the layer 50 comprises silicon, nitrogen, oxygen and hydrogen (col. 4, lines 33-36) that may be combined according to the formula : $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$, where the hydrogen content may be adjusted to impart a desired absorbance characteristic to the deposited layer.

Accordingly, Applicants submit that the Kumar reference fairly teaches a antireflective layer having a different chemical composition.” The examiner acknowledges that the Kumar reference does not teach the exact chemical composition claimed, since Kumar does not disclose the specific amount of Si, N, O and defined by the claimed ranges for x, y, and z. This was the basis for the 103(a) rejection presented above. The APA teaches the antireflective layer having the claimed composition. The main point of the above rejection was to modify the antireflective layer 18 of Kumar by using the composition taught by the APA. Whether or not the composition of the antireflective layer of Kumar can be represented by the formula $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ is immaterial to the rejection as a whole. Both the Kumar reference and the APA teach an antireflective layer comprising Si, N, O, and H, therefore the references can be combined as set forth above.

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Applicant further argues “Although the Applicant’s APA discloses a similar chemical formulation, and states similar ranges, Applicants nevertheless maintain that Applicant’s APA discloses a different structure”. The examiner acknowledges that the APA discloses a different structure, which is why a 103(a) rejection over Kumar in view of the APA was made. Applicant is essentially arguing against the references individually. However, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Note that Applicant presents similar arguments regarding claims 44 and 50, and those arguments are not persuasive for the reasons set forth above.

Applicant further argues that Chen does not teach tungsten silicide and titanium silicide are equivalent and that “a mere possibility does not rise to the level of equivalence”. Applicant’s arguments appear to be based on the fact that Chen discloses titanium is the preferred embodiment, while tungsten is a possible alternative. However, at not point does Chen suggest that tungsten is somehow inferior to titanium. Simply because one embodiment is indicated as being “preferred” does not mean the materials are not functional equivalents. Chen discloses the two materials can be used for the same purpose. Furthermore, Applicant’s own APA also establishes tungsten silicide and titanium silicide can be equivalently used for the same purpose (page 2, lines 11 and 12 of the instant application). The examiner has established that the prior art recognizes tungsten silicide and titanium silicide are equivalents known to be used for the same purpose, and therefore, a *prima facie* case of obviousness has been established (see MPEP 2144.06).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and (571) 273-8300 for After Final communications.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should any questions arise regarding access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Matthew C. Landau

March 13, 2007